XIII. *Extract of a Letter from the Right Honourable* Philip *Earl* Stanhope, *F. R. S. to Mr.* James Clow, *Professor of Philosophy in the University of* Glasgow. *Dated* Chevening, February 16, 1777.

Read June 10, 1780.

I HAVE lately made some curious observations concerning the roots of affected equations, part of which have occurred to Messieurs DANIEL BERNOULLI, EULER, DE LA GRANGE, LAMBERT, and others; but some of them, I believe, are quite new. I will give you one instance of a quadratic equation, as the simplest.

Let the quadratic equation $11xx - 15x + 5 = 0$, be proposed. I say then, that if two recurring series be formed from the fractions $\frac{1+2z}{1-z-zz}$, $\frac{2+3z}{1-z-zz}$, which have a common denominator, and each series of co-efficients, continued both ways (that is, as well before, as after the first term) the fractions formed by dividing each term of the first series by the corresponding term of the second series, *viz.*

&c. $\frac{-11}{-14}$, $\frac{+7}{+9}$, $\frac{-4}{-5}$, $\frac{+3}{+4}$, $\frac{-1}{-1}$, $\frac{-3}{-4}$, $\frac{2}{3}$, $\frac{1}{2}$, | $\frac{3}{5}$, $\frac{4}{7}$, $\frac{7}{12}$, $\frac{11}{19}$, $\frac{18}{31}$, $\frac{29}{50}$ &c.

will converge in the simplest manner possible; those before the bar, in a retrograde order to the greater root $\frac{15+\sqrt{5}}{22}$; and those after the bar, in a direct order to the smallest root $\frac{15-\sqrt{5}}{22}$; where it is to

 be

be obſerved, that the greater root is affirmative, notwithſtanding the ſign − being prefixed to ſome of the terms, becauſe in each fraction the numerator and the denominator are affected by the ſame ſign, whether + or −.

The chief improvement I have made conſiſts in approximating to two roots at once, by one and the ſame ſeries, continued backwards as well as forwards. I have not time to enlarge upon this ſubject at preſent; but the little I have ſaid will be a ſpecimen of the method to be uſed in higher equations.